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**TITLE:**

**REFASTENABLE ABSORBENT  
PRODUCT WITH Z-FOLDED  
SIDE PANELS AND METHOD  
OF MAKING SAME IN THE  
MACHINE DIRECTION**

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**REFASTENABLE ABSORBENT PRODUCT WITH  
Z-FOLDED SIDE PANELS AND METHOD OF  
MAKING SAME IN THE MACHINE DIRECTION**

**BACKGROUND OF THE INVENTION**

In the known art, there have been two ways of making a garment web into point of sale items. One is to put refastenable tabs, such as adhesive tape or hook and loop combinations onto the garment body, in the manner of an infant diaper, for 5 later use to secure the back panel of the diaper to the front panel. A second is to bond the side edges of the front and back sections together to make a closed garment with fixed seams, in the manner of a training pant which is slid on and off the wearer like adult underwear. To remove such a garment if it becomes soiled, it is necessary to break the side region, i.e., tear the sides of the product from waist opening to leg hole, in order to remove the garment like a diaper, as convenience and hygiene would dictate.

It is therefore desired to provide a garment, such as a training pant, which may be slid-on in the fashion of adult underwear while being easily removable in the manner of a diaper and which can be made with relatively 15 uncomplicated machinery in a space-efficient manner.

**SUMMARY OF THE INVENTION**

The present invention can provide a readily and inexpensively producible refastenable garment. The garment is desirably manufactured with its longitudinal axis in the machine direction. A web of garment chassis materials

extending in the machine direction is overlaid with a side panel web. The side panel web is attached to opposite width borders of the chassis web and has a first fastener member representing half of a cooperative fastener system, such as one of a hook and loop fastener, thereon extending in the machine direction. The side panel web and  
5 first fastener member are through-cut, or have a line of relative weakness, desirably at the fastener member midline, such that the side panel web can separate into two side panels.

The garment chassis has the second half of the cooperative fastener system, i.e. a second fastener member, disposed on an exterior surface thereof at the opposite end of the chassis along the machine direction from the first fastener member. The side panel web can be separated into two side panels and have each panel folded, typically in a "Z" fold, to place the first fasteners in position to be folded against the second fastener member when the garment chassis is folded in half.  
10 The side panel web can be shaped to provide an efficacious leg hole fit. The side panel web is further desirably extensible or elastic to provide an efficacious garment fit for the manufactured garment.  
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#### **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other objects and features of this invention will be better understood from the following detailed description taken in conjunction with the  
20 drawings wherein:

Fig. 1 is a side perspective view of an absorbent garment having refastenable side seams.

Fig. 2 is a plan view of an absorbent garment in a partially disassembled, stretched flat state, and showing the surface of the article that faces away from the wearer when the article is worn.  
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Fig. 3 is a plan view of an absorbent garment in a partially disassembled, stretched flat state, and showing the surface of the article that faces the wearer when the article is worn, and with portions cut away to show the underlying features.

Fig. 4 shows an in-process web during manufacture of the absorbent garment with refastenable side seams according to one embodiment of the present invention.  
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Fig. 5 shows an individuated garment from the interior side, unfolded, unfastened and laid out.

Fig. 6 is a highly schematic view of the side panels and garment chassis with the side panels undergoing folding in a Z-fold configuration.  
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Fig. 7 is a highly schematic view of the side panels and garment chassis with the side panels undergoing a second fold in a Z-fold configuration and wherein sides of the side panel web and the chassis web are coterminous.

Fig. 8 is a highly schematic view looking into the folded garment through the waist opening and showing the side panels fastened to the garment chassis.

Fig. 9 shows a schematic end view of a folded side panel web which may be used with the present invention.

Fig. 10 shows a schematic end view of a folded side panel web which may be used with the present invention wherein sides of a side panel web extend beyond the sides of the chassis web.

Fig. 11 shows a schematic end view of a folded side panel web which may be used with the present invention wherein sides of a side panel web lay within the sides of the chassis web.

#### DEFINITIONS

Within the context of this specification, each term or phrase below will include the following meaning or meanings.

“Article” refers to a garment or other end-use article of manufacture.

“Bonded” refers to the joining, adhering, connecting, attaching, or the like, of two elements. Two elements will be considered to be bonded together when they are bonded directly to one another or indirectly to one another, such as when each is directly bonded to intermediate elements.

“Chassis web” or “garment chassis web” for purposes of the present invention refers to that portion of an in-process or finished absorbent article or

garment exclusive of any non-integral side panels. A chassis web may be nonabsorbent, or absorbent with, or without, having specially adapted absorbent structures added thereto.

“Connected” refers to the joining, adhering, bonding, attaching, or the like, of two elements. Two elements will be considered to be connected together when they are connected directly to one another or indirectly to one another, such as when each is directly connected to intermediate elements.

“Disposable” refers to articles which are designed to be discarded after a limited use rather than being laundered or otherwise restored for reuse.

“Disposed,” “disposed on,” and variations thereof are intended to mean that one element can be integral with another element, or that one element can be a separate structure bonded to or placed with or placed near another element.

“Elastic,” “elasticized” and “elasticity” mean that property of a material or composite by virtue of which it tends to recover its original size and shape after removal of a force causing a deformation. “Extensible” does not imply recovery of the original size or shape.

“Elastomeric” refers to a material or composite which can be elongated by at least 25 percent of its relaxed length and which will recover, upon release of the applied force, at least 10 percent of its elongation. It is generally preferred that the elastomeric material or composite be capable of being elongated by at least 100

percent, more desirably by at least 300 percent, of its relaxed length and recover, upon release of an applied force, at least 50 percent of its elongation.

“Fabrics” is used to refer to all of the woven, knitted and nonwoven fibrous webs.

5 “Film” refers to a thermoplastic film made using a film extrusion and/or foaming process, such as a cast film or blown film extrusion process. The term includes apertured films, slit films, and other porous films which constitute liquid transfer films, as well as films which do not transfer liquid.

“Flexible” refers to materials which are compliant and which will readily conform to the general shape and contours of the wearer’s body.

10 “Hydrophilic” describes fibers or the surfaces of fibers which are wetted by the aqueous liquids in contact with the fibers. The degree of wetting of the materials can, in turn, be described in terms of the contact angles and the surface tensions of the liquids and materials involved. Equipment and techniques suitable for measuring the wettability of particular fiber materials or blends of fiber materials can be provided by a Cahn SFA-222 Surface Force Analyzer System, or a substantially equivalent system. When measured with this system, fibers having contact angles less than 90° are designated “wettable” or hydrophilic, while fibers having contact angles greater than 90° are designated “nonwettable” or hydrophobic.

“Integral” or “integrally” is used to refer to various portions of a single unitary element rather than separate structures bonded to or placed with or placed near one another.

5       “Layer” when used in the singular can have the dual meaning of a single element or a plurality of elements.

“Line of Weakness” is used to refer to a perforation, thinned area, nonpermanent or weak bond, or other means for facilitating separation of a material, a fabric or a layer of such material or fabric, whether defined by function or fabric type.

10      “Liquid impermeable,” when used in describing a layer or multi-layer laminate, means that a liquid, such as urine, will not pass through the layer or laminate, under ordinary use conditions, in a direction generally perpendicular to the plane of the layer or laminate at the point of liquid contact. Liquid, or urine, may spread or be transported parallel to the plane of the liquid impermeable layer or laminate, but this is not considered to be within the meaning of “liquid impermeable” when used herein.

15      “Liquid permeable material” or “liquid water-permeable material” refers to a material present in one or more layers, such as a film, nonwoven fabric, or open-celled foam, which is porous, and which is water permeable due to the flow of water and other aqueous liquids through the pores. The pores in the film or foam, or

spaces between fibers or filaments in a nonwoven web, are large enough and frequent enough to permit leakage and flow of liquid water through the material.

“Longitudinal” and “transverse” have their customary meaning, as indicated by the longitudinal and transverse axes directions depicted in Fig. 3. The longitudinal axis of a garment, or absorbent article, lies in the plane of the article and is generally parallel to a vertical plane that bisects a standing wearer into left and right body halves, when the article is worn. The transverse axis lies in the plane of the article generally perpendicular to the longitudinal axis. The article, although illustrated as longer in the longitudinal direction than in the transverse direction, need not be so.

“Machine direction” refers to the direction in which the web travels, as opposed to “cross direction” or “cross machine direction” which refers to a direction generally perpendicular to the machine direction.

“Meltblown fiber” means fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity heated gas (e.g., air) streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter. Thereafter, the meltblown fibers are carried by the high velocity gas stream and are deposited on a collecting surface to form a web of randomly dispersed meltblown fibers. Such a process is disclosed for example, in U.S. Patent 3,849,241 to Butin et al. Meltblown fibers are microfibers

which may be continuous or discontinuous, are generally smaller than about 0.6 denier, and are generally self bonding when deposited onto a collecting surface. Meltblown fibers used in the present invention are desirably substantially continuous in length.

5 "Member" when used in the singular can have the dual meaning of a single element or a plurality of elements.

"Nonwoven" and "nonwoven web" refer to materials and webs of material which are formed without the aid of a textile weaving or knitting process.

10 "Operatively joined," in reference to the attachment of an elastic member to another element, means that the elastic member when attached to or connected to the element, or treated with heat or chemicals, by stretching, or the like, gives the element elastic properties; and with reference to the attachment of a non-elastic member to another element, means that the member and element can be attached in any suitable manner that permits or allows them to perform the intended or described function of the joinder. The joining, attaching, connecting or the like can be either directly, such as joining either member directly to an element, or can be indirectly by means of another member disposed between the first member and the first element.

20 "Permanently bonded" refers to the joining, adhering, connecting, attaching, or the like, of two elements of an absorbent garment such that the elements tend to be and remain bonded during normal use conditions of the absorbent garment.

“Polymers” include, but are not limited to, homopolymers, copolymers, such as for example, block, graft, random and alternating copolymers, terpolymers, etc. and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term “polymer” shall include all possible geometrical configurations of the material. These configurations include, but are not limited to isotactic, syndiotactic and atactic symmetries.

“Refastenable” refers to the property of two elements being capable of releasable attachment, separation, and subsequent releasable reattachment without substantial permanent deformation or rupture.

“Releasably attached,” “releasably engaged” and variations thereof refer to two elements being connected or connectable such that the elements tend to remain connected absent a separation force applied to one or both of the elements, and the elements being capable of separation without substantial permanent deformation or rupture. The required separation force is typically beyond that encountered while wearing the absorbent garment.

Words of degree, such as “Substantially,” “About,” and the like are used herein in the sense of “at, or nearly at, when given the manufacturing and material tolerances inherent in the stated circumstances” and are used to prevent the unscrupulous infringer from unfairly taking advantage of the invention disclosure where exact or absolute figures are stated as an aid to understanding the invention.

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"Spunbond fiber" refers to small diameter fibers which are formed by extruding molten thermoplastic material as filaments from a plurality of fine capillaries of a spinnerette having a circular or other configuration, with the diameter of the extruded filaments then being rapidly reduced as by, for example, in U.S. Patent 4,340,563 to Appel et al., and U.S. Patent 3,692,618 to Dorschner et al., U.S. Patent 3,802,817 to Matsuki et al., U.S. Patents 3,338,992 and 3,341,394 to Kinney, U.S. Patent 3,502,763 to Hartmann, U.S. Patent 3,502,538 to Petersen, and U.S. Patent 3,542,615 to Dobo et al. Spunbond fibers are quenched and generally not tacky when they are deposited onto a collecting surface. Spunbond fibers are generally continuous and often have average deniers larger than about 0.3, more particularly, between about 0.6 and 10.

"Stretchable" means that a material can be stretched, without breaking, to at least 150% of its initial (unstretched) length in at least one direction, suitably to at least 200% of its initial length, desirably to at least 250% of its initial length.

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"Superabsorbent" or "superabsorbent material" refers to a water-swellable, water-insoluble organic or inorganic material capable, under the most favorable conditions, of absorbing at least about 15 times its weight and, more desirably, at least about 30 times its weight in an aqueous solution containing 0.9 weight percent sodium chloride. The superabsorbent materials can be natural, synthetic and modified natural polymers and materials. In addition, the

superabsorbent materials can be inorganic materials, such as silica gels, or organic compounds such as cross-linked polymers.

“Surface” includes any layer, film, woven, nonwoven, laminate, composite, or the like, whether pervious or impervious to air, gas, and/or liquids.

5 “Thermoplastic” describes a material that softens when exposed to heat and which substantially returns to a nonsoftened condition when cooled to room temperature.

“Z-fold” is used to describe a folding of the material back upon itself twice, in opposite directions, as may generally be seen in, or defined by, the shape of a letter “Z”.

These terms may be defined with additional language in the remaining portions of the specification.

#### **DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS**

The principles of the present invention can be incorporated into any suitable garment and especially disposable, or limited use, garments. Examples of such suitable garments may include, but are not limited to, diapers, training pants, incontinence products, other personal care or health care garments, or the like. For 20 ease of explanation, the description hereafter will be in terms of a child's training pant.

Referring to Figs. 1-3, one such example of a disposable absorbent garment, such as a training pant 20, is illustrated for broad purposes of explanation

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of certain materials and construction techniques suitable for use in a garment of the present invention. The training pant 20 includes an absorbent chassis 32 and a fastening system 80. The absorbent chassis 32 helps define areas of the training pant 20 including a front region 22, a back region 24, a crotch region 26 interconnecting  
5 the front and back regions, an inner surface 28 which is configured to contact the wearer, and an outer surface 30 opposite the inner surface which is configured to contact the wearer's clothing. The absorbent chassis 32 has a pair of transversely opposed side edges 36a, 36b and a pair of longitudinally opposed waist edges, which are designated front waist edge 38 and back waist edge 39. The front region 22 is contiguous with the front waist edge 38, and the back region 24 is contiguous with the back waist edge 39.

10 The illustrated absorbent chassis 32 may have a generally rectangular and absorbent composite structure, but may include other shapes such as those having leg cut outs, hour glass shapes, and other suitable shapes. Attached to the absorbent chassis 32 are a pair of transversely opposed front side panels 34. Alternatively, and most desirably, a pair of transversely opposed back side panels may be used instead of front side panels, as shown in Figs. 4-8, 10, and 11. The illustrated absorbent chassis 32 desirably includes an outer cover 40, a bodyside liner 42 (Fig. 3) which is connected to the outer cover in a superposed relation, an absorbent assembly 44  
15 (Fig. 3) which is located between the outer cover 40 and the bodyside liner 42, and a pair of containment flaps 46 (Fig. 3). Although illustrated as having an absorbent assembly, the chassis structure of the present invention need not include a specially  
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adapted absorbent structure. For reference, arrows 48 and 49 depicting the orientation of the longitudinal axis and the transverse axis directions, respectively, of the training pant 20 are illustrated in Figs. 2 and 3.

With the training pant 20 in the partially fastened position as illustrated in Fig. 1, the panels 34 join the front and back regions 22 and 24, or front and back center panels 35, 135, together to define a three-dimensional pant configuration having a waist opening 50 and a pair of leg openings 52. The front region 22 includes the portion of the training pant 20 which, when worn, is positioned on the front of the wearer while the back region 24 includes the portion of the training pant which, when worn, is positioned on the back of the wearer. The crotch region 26 of the training pant 20 includes the portion of the training pant which, when worn, is positioned between the legs of the wearer and covers the lower torso of the wearer. The front side panels 34 include the portions of the training pant 20 which, when worn, are positioned on the hips of the wearer.

The front region 22 of the training pant 20 includes the transversely opposed front side panels 34 and a front center panel 35 (Figs. 2 and 3) positioned between and interconnecting the side panels, along with a front waist elastic member 54 and any other connected components. The back region 24 of the training pant 20 includes a back panel 135 (Figs. 2 and 3) as well as a rear waist elastic member 56 and any other connected components. The waist edges 38 and 39 of the absorbent chassis 32 and waist end edges 72 of the panels 34 are configured to encircle the waist of the wearer when worn and provide the waist opening 50 which

defines a waist perimeter dimension. Portions of the transversely opposed side edges 36a, 36b in the crotch region 26, and leg end edges 70 of attached side panels 34, generally define the leg openings 52.

The training pant 20 is configured to contain and/or absorb any body exudates discharged from the wearer. For example, the absorbent chassis 32 desirably although not necessarily includes the pair of containment flaps 46 which are configured to provide a barrier to the transverse flow of body exudates. A flap elastic member 53 (Fig. 3) is operatively joined with each containment flap 46 in any suitable manner as is well known in the art. The elasticized containment flaps 46 define an unattached edge which assumes an upright, generally perpendicular configuration in at least the crotch region 26 of the training pant 20 to form a seal against the wearer's body. The containment flaps 46 can be located along the transversely opposed side edges 36a, 36b of the absorbent chassis 32, and can extend longitudinally along the entire length of the absorbent chassis 32 or may only extend partially along the length of the absorbent chassis 32. Suitable constructions and arrangements for the containment flaps 46 are generally well known to those skilled in the art and are described in U.S. Patent 4,704,116 issued November 3, 1987 to Enloe.

To further enhance containment and/or absorption of body exudates, the training pant 20 desirably includes the front waist elastic member 54, the rear waist elastic member 56, and leg elastic members 58, as are known to those skilled in the art (Fig. 3). The waist elastic members 54 and 56 can be operatively joined to

the outer cover 40 and/or bodyside liner 42 along the opposite waist edges 38 and 39, and can extend over part or all of the waist edges. The leg elastic members 58 are desirably operatively joined to the outer cover 40 and/or bodyside liner 42 along the transversely opposed side edges 36a, 36b and positioned in the crotch region 26 of the training pant 20. The leg elastic members 58 are desirably longitudinally aligned along each transversely opposed side edge 36a, 36b of the absorbent chassis 32. Each leg elastic member 58 has a front terminal point 63 and a back terminal point 65, which points represent the longitudinal ends of the elastic gathering caused by the leg elastic members.

The flap elastic members 53, the waist elastic members 54 and 56, and the leg elastic members 58 can be formed of any suitable elastic material. As is well known to those skilled in the art, suitable elastic materials include sheets, strands or ribbons of natural rubber, synthetic rubber, or thermoplastic elastomeric polymers. The elastic materials can be stretched and adhered to a substrate, adhered to a gathered substrate, or adhered to a substrate and then elasticized or shrunk, for example with the application of heat; such that elastic constrictive forces are imparted to the substrate. In one particular embodiment, for example, the leg elastic members 58 include a plurality of dry-spun coalesced multifilament spandex elastomeric threads sold under the trade name LYCRA® and available from E.I. DuPont de Nemours and Company, Wilmington, Delaware, U.S.A.

The outer cover 40 desirably includes a material that is substantially liquid impermeable, and can be elastic, stretchable or nonstretchable. The outer

cover 40 can be a single layer of liquid impermeable material, but desirably includes a multi-layered laminate structure in which at least one of the layers is liquid impermeable. For instance, the outer cover 40 can include a liquid permeable outer layer and a liquid impermeable inner layer that are suitably joined together by a  
5 laminate adhesive (not shown). Suitable laminate adhesives, which can be applied continuously or intermittently as beads, a spray, parallel swirls, or the like, can be obtained from Findley Adhesives, Inc., of Wauwatosa, Wisconsin, U.S.A., or from National Starch and Chemical Company, Bridgewater, New Jersey, U.S.A. The liquid permeable outer layer can be any suitable material and desirably one that provides a generally cloth-like texture. One example of such a material is a 20 gsm (grams per square meter) spunbond polypropylene nonwoven web. The outer layer may also be made of those materials of which liquid permeable bodyside liner 42 is made. While it is not a necessity for the outer layer to be liquid permeable, it is desired that it provides a relatively cloth-like texture to the wearer.

15           The inner layer of the outer cover 40 can be both liquid and vapor impermeable, or can be liquid impermeable and vapor permeable. The inner layer is desirably manufactured from a thin plastic film, although other flexible liquid impermeable materials may also be used. The inner layer, or the liquid impermeable outer cover 40 when a single layer, prevents waste material from wetting articles,  
20           such as bedsheets and clothing, as well as the wearer and care giver. A suitable liquid impermeable film for use as a liquid impermeable inner layer, or a single layer liquid impermeable outer cover 40, is a 0.2 millimeter polyethylene film commercially

available from Huntsman Packaging of Newport News, Virginia, U.S.A. If the outer cover 40 is a single layer of material, it can be embossed and/or matte finished to provide a more cloth-like appearance. As earlier mentioned, the liquid impermeable material can permit vapors to escape from the interior of the disposable absorbent article, while still preventing liquids from passing through the outer cover 40. A suitable "breathable" material is composed of a microporous polymer film or a nonwoven fabric that has been coated or otherwise treated to impart a desired level of liquid impermeability. A suitable microporous film is a PMP-1 film material commercially available from Mitsui Toatsu Chemicals, Inc., Tokyo, Japan, or an XKO-8044 polyolefin film commercially available from 3M Company, Minneapolis, Minnesota.

The liquid permeable bodyside liner 42 is illustrated as overlying the outer cover 40 and absorbent assembly 44, and may, but need not, have the same dimensions as the outer cover 40. The bodyside liner 42 is desirably compliant, soft feeling, and non-irritating to the child's skin. Further, the bodyside liner 42 can be less hydrophilic than the absorbent assembly 44, to present a relatively dry surface to the wearer and permit liquid to readily penetrate through its thickness.

The bodyside liner 42 can be manufactured from a wide selection of web materials, such as synthetic fibers (for example, polyester or polypropylene fibers), natural fibers (for example, wood or cotton fibers), a combination of natural and synthetic fibers, porous foams, reticulated foams, apertured plastic films, or the like. Various woven and nonwoven fabrics can be used for the bodyside liner 42.

For example, the bodyside liner can be composed of a meltblown or spunbond web of polyolefin fibers. The bodyside liner can also be a bonded-carded web composed of natural and/or synthetic fibers. The bodyside liner can be composed of a substantially hydrophobic material, and the hydrophobic material can, optionally, be  
5 treated with a surfactant or otherwise processed to impart a desired level of wettability and hydrophilicity. For example, the material can be surface treated with about 0.45 weight percent of a surfactant mixture including AHCOVEL® N-62 from Hodgson Textile Chemicals of Mount Holly, North Carolina, U.S.A. and GLUCOPON® 220UP from Henkel Corporation of Ambler, Pennsylvania, in an active ratio of 3:1. The surfactant can be applied by any conventional means, such as spraying, printing, brush coating or the like. The surfactant can be applied to the entire bodyside liner 42 or can be selectively applied to particular sections of the bodyside liner, such as the medial section along the longitudinal centerline.

A suitable liquid permeable bodyside liner 42 is a nonwoven bicomponent web having a basis weight of about 27 gsm. The nonwoven bicomponent can be a spunbond bicomponent web, or a bonded carded bicomponent web. Suitable bicomponent staple fibers include a polyethylene/polypropylene bicomponent fiber available from CHISSO Corporation, Osaka, Japan. In this particular bicomponent fiber, the polypropylene forms the core and the polyethylene forms the sheath of the fiber. Other fiber orientations are possible, such as multi-lobe, side-by-side, end-to-end, or the like. While the outer cover 40 and bodyside liner 42 can include elastomeric materials, it can be desirable in some embodiments for the  
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absorbent chassis to be generally inelastic, where the outer cover, the bodyside liner and the absorbent assembly include materials that are generally not elastomeric.

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The absorbent assembly 44 (Fig. 3) can be positioned between the outer cover 40 and the bodyside liner 42, which components can be joined together by any suitable means, such as adhesives, as is well known in the art. The absorbent assembly 44 can be any structure which is generally compressible, conformable, non-irritating to the child's skin, and capable of absorbing and retaining liquids and certain body wastes. The absorbent assembly 44 can be manufactured in a wide variety of sizes and shapes, and from a wide variety of liquid absorbent materials commonly used in the art. For example, the absorbent assembly 44 can suitably include a matrix of hydrophilic fibers, such as a web of cellulosic fluff, mixed with particles of a high-absorbency material commonly known as superabsorbent material. In a particular embodiment, the absorbent assembly 44 includes a matrix of cellulosic fluff, such as wood pulp fluff, and superabsorbent hydrogel-forming particles. The wood pulp fluff can be exchanged with synthetic, polymeric, meltblown fibers or with a combination of meltblown fibers and natural fibers. The superabsorbent particles can be substantially homogeneously mixed with the hydrophilic fibers or can be nonuniformly mixed. The fluff and superabsorbent particles can also be selectively placed into desired zones of the absorbent assembly 44 to better contain and absorb body exudates. The concentration of the superabsorbent particles can also vary through the thickness of the absorbent assembly 44. Alternatively, the absorbent

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assembly 44 can include a laminate of fibrous webs and superabsorbent material or other suitable means of maintaining a superabsorbent material in a localized area.

Suitable superabsorbent materials can be selected from natural, synthetic, and modified natural polymers and materials. The superabsorbent materials can be inorganic materials, such as silica gels, or organic compounds, such as crosslinked polymers. Suitable superabsorbent materials are available from various commercial vendors, such as Dow Chemical Company located in Midland, Michigan, U.S.A., and Stockhausen GmbH & Co. KG, D-47805 Krefeld, Federal Republic of Germany. Typically, a superabsorbent material is capable of absorbing at least about 15 times its weight in water, and desirably is capable of absorbing more than about 25 times its weight in water.

In one embodiment, the absorbent assembly 44 can be generally rectangular in shape, and includes a blend of wood pulp fluff and superabsorbent material. One preferred type of fluff is identified with the trade designation CR1654, available from U.S. Alliance, Childersburg, Alabama, U.S.A., and is a bleached, highly absorbent sulfate wood pulp containing primarily soft wood fibers. As a general rule, the superabsorbent material is present in the absorbent assembly 44 in an amount of from about 0 to about 90 weight percent based on total weight of the absorbent assembly. The absorbent assembly 44 suitably has a density within the range of about 0.10 to about 0.50 grams per cubic centimeter. The absorbent assembly 44 may or may not be wrapped or encompassed by a suitable tissue wrap that maintains the integrity and/or shape of the absorbent assembly.

The absorbent chassis 32 can, if desired, also incorporate other materials that are designed primarily to receive, temporarily store, and/or transport liquid along the mutually facing surface with the absorbent assembly 44, thereby maximizing the absorbent capacity of the absorbent assembly. One suitable material  
5 is referred to as a surge layer (not shown) and includes a material having a basis weight of about 50 to about 120 grams per square meter, and including a through-air-bonded-carded web of a homogenous blend of 60 percent 3 denier type T-256 bicomponent fiber including a polyester core/polyethylene sheath and 40 percent 6 denier type T-295 polyester fiber, both commercially available from Kosa Corporation of Salisbury, North Carolina, U.S.A.

As noted previously, the illustrated training pant 20 of Figs. 1-3 has front side panels 34 disposed on each side of the absorbent chassis 32. Alternatively, and more desirably, back side panels 134 may be disposed on each side of the absorbent chassis 32 at the back region of the garment 24 as seen in Figs. 4-8. The  
15 transversely opposed side panels 34 or 134 can be permanently bonded to the absorbent chassis 32 in the front 22, or back 24 (Fig. 5) regions, respectively, and are releasably attached to the garment chassis 32 by a fastening system 80. More particularly, in Figs. 2 and 3, the front side panels 34 can be permanently bonded to the front region 22 along attachment lines 66 proximal to transversely opposed side edges 36a, 36b. The side panels may be attached using attachment means known to  
20 those skilled in the art such as adhesive, thermal, or ultrasonic bonding, or combinations thereof.

In particular embodiments for improved fit and appearance, the side panels of the present invention desirably have an average length dimension measured parallel to the longitudinal axis direction 48 that is about 20 percent or greater, and particularly about 25 percent or greater, of the overall length dimension of the absorbent article, also measured parallel to the longitudinal axis direction 48. For example, in training pants having an overall length dimension of about 54 centimeters, the side panels 34 desirably have an average length dimension of about 10 centimeters or greater, such as about 15 centimeters. Each of the side panels of the present invention extends from the waist opening 50 to one of the leg openings 52.

Each of the side panels 34 of the present invention can include one or more individual, distinct pieces of material. In particular embodiments, for example, each side panel 34 can include first and second side panel portions that are joined at a seam, with at least one of the portions including an elastomeric material. Still alternatively, each individual side panel can include a single piece of material which is folded over upon itself along an intermediate fold line (not shown).

The side panels of the present invention desirably include an elastic material capable of stretching in a direction generally parallel to the transverse axis direction 49 of the training pant 20. In particular embodiments, the front or back side panels 34,134, respectively, may include an interior portion 78 disposed between the distal edge 68 and the respective front or back center panel 35 or 135. In the illustrated embodiment in Fig. 3, the interior portions 78 are disposed between the

distal edges 68 and the opposed side edges 36a, 36b of the absorbent chassis 32. The elastic material of the side panels 34 can be disposed in the interior portions 78 to render the side panels elastomeric in a direction generally parallel to the transverse axis. Most desirably, each side panel 34 is elastomeric from a waist end edge 72 to a leg end edge 70. More specifically, individual samples of side panel material, taken between the waist end edge 72 and the leg end edge 70 parallel to the transverse axis direction 49 and having a length from the attachment line 66 to the distal edge 68 and a width of about 2 centimeters, are all elastomeric.

Suitable elastic materials, as well as one described process of incorporating elastic side panels into a training pant, are described in the following U.S. Patents: 4,940,464 issued July 10, 1990 to Van Gompel et al.; 5,224,405 issued July 6, 1993 to Pohjola; 5,104,116 issued April 14, 1992 to Pohjola; and 5,046,272 issued September 10, 1991 to Vogt et al. In particular embodiments, the elastic material includes a stretch-thermal laminate (STL), a neck-bonded laminated (NBL), a reversibly necked laminate, or a stretch-bonded laminate (SBL) material. Methods of making such materials are well known to those skilled in the art and described in U.S. Patent 4,663,220 issued May 5, 1987 to Wisneski et al.; U.S. Patent 5,226,992 issued July 13, 1993 to Morman; and European Patent Application No. EP 0 217 032 published on April 8, 1987 in the names of Taylor et al. Alternatively, the side panel material may include other woven or nonwoven materials, such as those described above as being suitable for the outer cover 40 or bodyside liner 42, or stretchable but inelastic materials.

The training pant 20 according to the present invention also includes a fastening system 80 for securing the training pant about the waist of the wearer (Fig. 1). The illustrated fastening system 80 includes fastening components 82 that are adapted to refastenably connect to mating, also sometimes referred to as cooperating or complementary, fastening components 84. In one embodiment, one surface of each of the fastening components 82 and 84 includes a plurality of engaging elements that project from that surface. It will be noted that the fastening components 82, 84 project from different surfaces of the chassis according to the illustrated embodiments. The engaging elements of these fastening components 82 are adapted to repeatedly engage and disengage the engaging elements of the mating fastening components 84.

In one particular embodiment, the fastening components 82 each include hook type fasteners and the mating fastening components 84 each include complementary loop type fasteners. In another particular embodiment, the fastening components 82 each include loop type fasteners and the mating fastening components 84 each include complementary hook type fasteners. The fastening components 82 and the mating fastening components 84 are desirably rectangular, although they may alternatively be square, round, oval, curved or otherwise non-rectangularly shaped, may include a plurality of fastening elements, or be included as a surface layer with the target fastening regions (see Fig. 10).

Loop type fasteners typically include a fabric or material having a base or backing, or carrier, structure and a plurality of loop members extending upwardly

from at least one surface of the backing structure. The loop material can be formed of any suitable material, such as acrylic, nylon or polyester, and can be formed by methods such as warp knitting, stitch bonding or needle punching. Suitable loop materials are available from Guilford Mills, Inc., Greensboro, North Carolina, U.S.A. under the trade designation No. 36549.

Hook type fasteners typically include a fabric or material having a base or backing, or carrier, structure and a plurality of hook members extending upwardly from at least one surface of the backing structure. In contrast to the loop type fasteners which desirably include a flexible fabric, the hook material advantageously includes a resilient material to minimize unintentional disengagement of the fastener components as a result of the hook material becoming deformed and catching on clothing or other items. The term "resilient" as used in this context refers to an interlocking material having a predetermined shape and the property of the interlocking material to resume the predetermined shape after being engaged and disengaged from a mating, complementary interlocking material. Suitable hook material can be molded or extruded of nylon, polypropylene or another suitable material. Suitable single-sided hook materials for the fastening components 82 or the mating fastening components 84 are available from Velcro Industries B.V., Amsterdam, Netherlands or affiliates thereof, and are identified as Velcro HTH-829 with a uni-directional hook pattern and having a thickness of about 0.089 millimeters (3.5 mils) and HTH-851 with a uni-directional hook pattern and having a thickness of about 0.051 millimeters (2 mils).

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Referencing Figs. 4-8, 10 and 11, according to a desired alternative embodiment of the invention, a garment web 86 of pre-individuated refastenable garments is made from a garment chassis web 88 and a side panel web 90 split into first and second side panels 134a and 134b, respectively. The chassis web 88 is desirably absorbent and may be suitably constructed with any necessary material layers or components as set forth herein or otherwise known in the art to produce the desired functionality of an incontinence garment or the like. Conversely, the present invention may be utilized to produce ordinary adult underpants of the disposable variety without particular regard to the absorbent aspects of the garment. The chassis web 88 includes the liner, i.e., inside or interior, surface 28 to be placed against the skin of the wearer, and the outside or exterior surface 30. As is known, the chassis web 88 is transported for manufacture with its longitudinal axis in, or defining, the machine direction 94 and has a width 96 transverse thereto in the cross machine, or cross, direction 98 between first and second transversely opposed side edges 36a, 36b of the chassis web, respectively.

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The side panel web 90, comprises any spunbond or other suitable materials or laminates set forth herein or otherwise known in the art, and desirably having elasticity, or extensibility, in the cross direction 98; i.e. the transverse direction of the resultant garment. The side panel web 90 is laid over the interior surface 28 of the chassis web 88 and secured thereto. Alternatively, other suitable arrangements, including attachment to the exterior surface 30, may be used. The side panel web 90 has a first, waist end edge 72, indicated as being straight and, in the

illustrative embodiment, a second, leg end edge 70, here shown as sinusoidal although other shapes including straight, are possible. The side panel web waist end edge 72 is desirably aligned on the cross direction 98, i.e., perpendicular with the edges, 36a, 36b of the chassis web 88.

5 Bonded to, or otherwise disposed on, the side panel web 90 is a first fastener component, or strip, 82. The first fastener strip 82 is represented as the loop portion of a cooperative hook and loop mechanical fastener system although it may be the hook portion or may be another part of a suitable fastening system. The first fastener strip 82 desirably, but not necessarily, extends the entire length between edges 72, 70 of the side panel web 90, i.e., in the machine direction as shown in the illustrated embodiment. The leg end edge 70 provides varying distances between the waist end edge 72 with troughs 100 in the sinusoidal leg end edge 70 being closer to the waist end edge 72 and crests 102 being farthest therefrom. The longitudinal axis 104, of the first fastener strip 82 can be centered at the troughs 100 to allow the crests 102, or crest area, to provide a sufficient back, or rear, portion of the garment side panel for coverage of the buttock area of the wearer as will be appreciated upon a thorough understanding of the present invention.

10 The side panel web 90, desirably with the fastener strip 82 previously disposed thereon, can be secured at attachment lines 66, desirably with adhesives and ultrasonic bonds, to the chassis web 88 at, or proximal to, the opposed chassis edges 20 36a, 36b, at either of the interior or exterior surfaces 28, 30, respectively. As seen in Fig. 7 the sides of the side panel web 90, as divided into first and second back side

panels 134a, 134b, may be coterminous with transversely opposed side edges 36a, 36b of the chassis web 88. Alternatively, Fig. 10 shows a schematic end view of a folded side panel web which may be used with the present invention wherein sides of a side panel web 90 extend beyond the transversely opposed side edges 36a, 36b of the chassis web 88. The side panel web 90 is noted as having an integral or bonded layer of loop material type complementary fastener substantially covering one surface, as may be used in various embodiments of the present invention. Alternatively, Fig. 11 shows a schematic end view of a folded side panel web which may be used with the present invention wherein sides of a side panel web 90 lay within the transversely opposed side edges 36a, 36b of the chassis web 88. Thus, a side panel web, e.g. 90, may extend beyond the chassis web transversely opposed side edges 36a, 36b, be coterminous or congruent therewith, or may lay within the transversely opposed side edges 36a, 36b, as shown in Figs. 7, 10 and 11, or may include combinations of the above arrangements within a single garment or within 15 a single edge of a single garment.

The first fastener strip 82 can be adhered and bonded, or otherwise secured to the side panel web 90 along its longitudinal axis 104 with a bond of a specified width 108. The bond desirably, although not necessarily, secures the entire undersurface of the loop fastener component to the side panel web 90. At this stage 20 of manufacture, the loops of the illustrated embodiment desirably, but not necessarily, face into the plane of the paper in Fig. 4, and toward the chassis web 88. The width of the bond 108 can be then bisected by a perforation line 114 extending through the

thickness of the loop fastener and the underlying side panel web material to form first and second side panels 134a, 134b, each with a first fastener strip portion 82a, 82b, respectively (Fig. 5). The perforation line may be any form of cut or cuts or line of weakness necessary to achieve the separability of the side panel web 90 into separate side panels 134a, 134b prior to, or upon, use by the wearer, including a through-cut at the time of manufacture. As previously noted, a separate loop fastener strip may be unnecessary if the surface of the side panel or other target garment portion for hook engagement is adequate to achieve the fastening function.

The second half of the complementary fastening component system, shown, although not required, to be first and second hook fastener components, or strips, 84a, 84b, respectively, can be bonded to the exterior side 30 of the chassis web 88 at the opposite end of the garment along the machine direction from the loop component 82, so as to be placed proximal to the transversely opposed first and second edges 36a, 36b of the chassis web 88. The length of the hook fasteners 84a, 84b can, but need not, correspond to the length of the loop fasteners 82a, 82b. The hook fasteners 84a, 84b may be fully or partially secured over their contact area with the chassis web 88. It is noted that the fastening components may be carried on a base material which can be attached to the side panel web 90.

Referencing Fig. 6, the side panels 134a, 134b are separated and folded into a first position at fold points 120, 122 at a point beyond their attachment lines 66 with the chassis web 88 to place the loop fasteners, 82a, 82b outboard of the chassis

web 88. If two side panels are used as in Figs. 1-3, the side panels need not meet at the garment midline as illustrated for the side panel web in Fig. 4.

Referencing Figs. 6 and 7, half the garment, by way of example, the hook fastener half, can be folded at the garment transverse midline 118, i.e., folded along the transverse axis, to place the hook and loop fasteners 82a, 82b, 84a, 84b in proximity at one end of the individuated garment 128. A second, or "Z", fold, i.e., folding the side panels 134a, 134b back on themselves in the opposite direction at a point on the side panels beyond the first fold point, back toward the chassis web 88; can be then performed on the side panels 134a, 134b at second fold points 123, 124, to bring the loop fasteners 82a, 82b into proximity, and if desired, into fastening opposition, with the hook fasteners 84a, 84b, as indicated sequentially in Figs. 7 and 8. Bonds are indicated by "x" in Figs. 7, 8, 10 and 11.

Referencing Fig. 9, the side panel web 90 in some embodiments may comprise variously folded material in order to provide additional length to the side panels of their resultant garments within the scope of the present invention.

Various folding machinery exists in the art to fold the side panels and garment chassis in the manner described. The transverse midline fold desirably places the interior surface 28 in facing relationship to itself. It will be noted that the garments made according to the present invention could be provided as a roll with perforations between the garments rather than as a completely separated or individuated garment 128 as shown in Figs. 5-8, 10 and 11.

It will be appreciated that while the present invention has been described in terms of a single chassis web track traveling in the machine direction, efficiencies may be gained by practicing the teachings of the present invention in conjunction with multiple side-by-side tracks of chassis webs traveling in the machine direction.

While in the foregoing specification a compact, easily manufacturable, and desirably absorbent garment with refastenable seams, and a method of making such a garment, has been described in relation to certain embodiments thereof, and many details have been set forth for purpose of illustration, it will be apparent to those skilled in the art that the invention is susceptible to additional embodiments and that certain of the details described herein can be varied considerably without departing from the basic principles of the invention.

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